Decision Tools for Chemical Engineers (ChBE 405/506)

Gerald G. (Gerry) McGlamery Jr., Ph.D.
Fall 2019

Logistics

Schedule: Monday – Wednesday – Friday 10:00-10:50 a.m.
Location: AEL (Abercormbie Engineering Lab) A121

Instructor Contact Information

Instructor: Gerald G. (Gerry) McGlamery Jr., Ph.D.
Office: AEL (Abercormbie Engineering Lab) B240
Email: gerald.mcglamery@rice.edu
Office Hours: Monday and Wednesday 1:00-2:00 p.m. or by appointment

Course Objectives and Learning Outcomes

- Understand decision frameworks for chemical engineers
- Develop a working vocabulary in managerial accounting and its particular application to capital budgeting
- Understand the value of money with respect to time
- Apply the tools of capital budgeting, particularly cash flows, net present value, and internal rate of return
- Understand the principles of capital cost estimation
- Apply tools for decision-making under conditions of uncertainty
- Develop data required for project economics and life–cycle analysis
- Apply financial tools to your personal finances
- Evaluate life–cycle analyses against ISO 14040

Recommended Textbooks

Towler, Gavin, and R. K. Sinnott. Chemical Engineering Design: Principles, Practice and Economics of Plant and Process Design. Amsterdam: Elsevier Science & Technology (2012).

Available online at Fondren Library
Chapters 7-9 are relevant

Matthews, H. Scott. *Life Cycle Assessment: Quantitative Approaches for Decisions that Matter*. Self-published under Creative Commons License (2015).

Available free online at https://www.lcatextbook.com

Required Software

- Microsoft Excel
  - Available on every campus PC
- Palisade DecisionTools 7.5.2 suite
  - We'll use the following modules:
    - TopRank
    - @RISK
    - PrecisionTree
  - Available on campus PCs in the following locations:
    - Fondren Library
    - Mudd 101
    - Oshman Engineering Design Kitchen
    - Ryon Engineering Lab 102
    - Symonds I (Sewall Hall 207)
    - Symonds II (Duncan Hall 1020)
- Available on a virtual desktop (VDI)
- You can buy a student copy directly from Palisade for 50 USD

Exams and Papers

- We will have three exams, including the final exam
    - The final exam will be comprehensive, per university policy
- Exam problems will be designed for solution by calculator
    - No laptops
    - No phones with calculator apps
- Work product standards are applicable
- Exams are closed book
    - You will be given all formulas
    - No other notes are allowed
    - Turn in the formula sheet(s) with the exam
- Copies will be made and kept of your exams
- You will have two memo-length papers.

Grade Basis

- Exams 40 %
- Papers 30 %
- Homework 20 %
- Classroom discussion 10 %

Regrade Policy

- Submit a request in writing to me within one week of return
- All work will be regraded, not just the work in question

Classroom Participation and Attendance Policy

We will be discussing topics where different approaches can give different answers. Classroom discussion is important to understanding the differences. Reading will be assigned to facilitate the discussion. Your preparation for and participation in the discussion is expected and part of your grade.

Attendance in class is expected and is part of your classroom participation grade. You will lose one point for each class that you miss on your classroom participation grade, up to the full 10 % of credit for classroom participation. You can avoid this penalty if you discuss the need for your absence with the instructor before it occurs and obtain approval to miss the class. You will still be responsible for the lecture material, classroom discussion, and homework due on that particular class day.

Work Product Standards

- Submit all homework and papers through Canvas
- All written work should be clear and easy to follow
- If I can't read it, I won't grade it
- Late work is unacceptable
- 10 % off for each day late
- Cite your data sources in all work; use a consistent format
- Use only significant figures; egregious errors will lose points
- Grammar errors will be marked; egregious errors will lose points
- If in doubt, ask — in advance

Rice Honor Code

In this course, all students will be held to the standards of the Rice Honor Code, a code that you pledged to honor when you matriculated at this institution. If you are unfamiliar with the details of this code and how it is administered, you should consult the Honor System Handbook at http://honor.rice.edu/honor-system-handbook/. This handbook outlines the University's expectations for the integrity of your academic work, the procedures for resolving alleged violations of those expectations, and the rights and responsibilities of students and faculty members throughout the process.

Disability Resource Center

If you have a documented disability or other condition that may affect academic performance, you should:

- Make sure this documentation is on file with the Disability Resource Center (Allen Center, Room 111 / adarice@rice.edu / x5841) to determine the accommodations you need.

- Talk with me to discuss your accommodation needs.

Syllabus Change Policy

This syllabus is only a guide for the course and is subject to change with advanced notice.

Course Topics

- Decision frameworks
- Financial statements
- Financial ratios
- Project accounting
- Taxes
- Money
- Capital budgeting

Exam 1: Decision frameworks – Money

- Spreadsheet modeling
- Lease versus invest
- Supply curves
- Project execution
- Cost estimation
- Data

Exam 2: Capital budgeting – Cost estimation

- Uncertainty and risk
- Forecasting
- Life-cycle assessment
- LCA in practice
- Real options
- Cognitive challenges
- Final thoughts

Final exam